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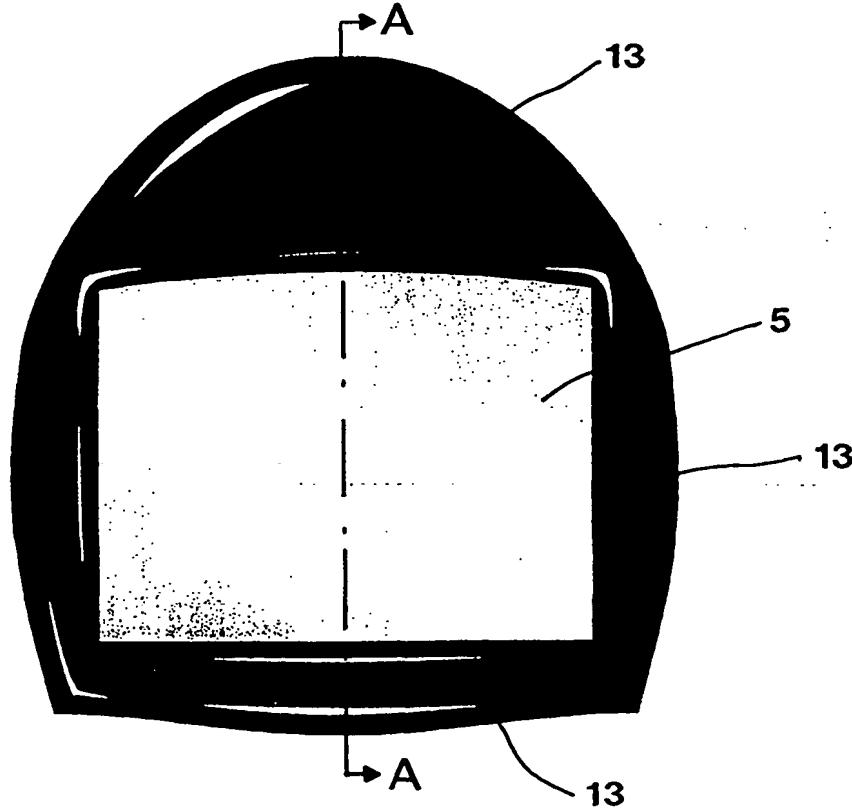
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(54) Title: DISPLAY COVER

(57) Abstract

The present invention relates to a display cover, e.g. for mobile phones, said display cover being intended to be applied over a display of a device. In connection with devices that are equipped with a display, e.g. mobile phones, said display being subjected to external damage, e.g. in the shape of scratches and impacts, during use of said device. This gives rise to scratches upon the display and consequently reading of the information in the display is made more difficult. The display cover according to the present invention is characterized in that it includes an optically clear protective film (1), said protective film (1) carrying on one side a protective frame (13) of a shock absorbing material, that said protecting frame (13) defines a display window (5) on the protective film (1), that the protective film (1) has surface portions on the side that faces away from the protective frame (13), said surface portions being equipped with an adhesive or prepared for receiving an adhesive.



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## DISPLAY COVER

## Technical Field of the Invention

The present invention relates to a display cover, e.g. for mobile phones, said display cover being intended to be applied over a display of a device. The invention also relates to a method for manufacturing a display cover according to the present invention.

## 10 Prior Art

When mobile phones are delivered it is common that they are provided with a protective film attached to the display of the mobile phone. The purpose of said protective film is not for permanent use but it is intended to constitute a protection for transport, said protection being removed when the use of the mobile phone is initiated. This means that the display of the mobile phone is unprotected when the mobile phone is put into use. Although it is not necessary to remove said protective film in connection with the initiated use of the mobile phone, the material of the protective film or its adhesion against the display is not of such a quality that it is suitable for permanent use. Normally, said protective film is not completely transparent and damage of the protective film will occur after some time of normal use of the mobile phone, e.g. in the shape of scratches and other wear. This will to a further degree make it more difficult to read the information disclosed in the display. It is also likely that the protective film will loosen, the loosening beginning in the corner areas of the protective film, which eventually results in that the entire protective film loosens from the display.

In this connection it should also be pointed out that normally the material itself in the display is not especially durable against scratches or other wear, and thus after some time of use there might arise problems to read the information disclosed in the display.

**Objects and Features of the Invention**

A primary object of the present invention is on one hand to provide an effective protection against scratches and other wear of a display and on the other hand to provide a 5 protection against shocks and impacts for said display and adjacent areas of the equipment having said display.

A further object of the display cover according to the present invention is that at least a part of the display cover should be self-restoring to a certain extent.

10 At least the primary object of the present invention is achieved by means of a display cover that has been given the features defined in the appending independent claim.

Preferred embodiments of the invention are defined in the independent claims.

15

**Brief Description of the Drawings**

An embodiment of a display cover according to the present invention has been described below, reference being made to the accompanying drawings, where:

20 Figure 1 shows a perspective view of the cutting of a sheet of a primary material of the protective film of the display cover;

Figure 2 shows a perspective view of the cut out sheet where adhesion coating has been applied on certain areas, 25 a portion of said areas being disclosed in a larger scale;

Figure 3 shows a perspective view where cutting out of blanks for the display cover is effected, such a blank being disclosed in a larger scale;

30 Figure 4a shows a perspective view of the blank according to figure 3;

Figure 4b shows a top view of the blank according to figure 3;

35 Figure 5a shows a perspective view of the blank according to figure 3 when a shot of material is applied to said blank, said material in hardened state being shock absorbing;

Figure 5b shows a top view of the blank according to figure 3 when a shot of a material is applied to said blank,

said material in hardened state being shock absorbing;

Figure 6a shows a perspective view illustrating how the material, that in hardened state is shock absorbing, has been spread out on the frame of the display cover, said frame being equipped with adhesion coating;

Figure 6b shows a top view illustrating how the material, that in hardened state is shock absorbing, has been spread out on the frame of the display cover, said frame being equipped with adhesion coating;

Figure 7a shows a perspective view of a blank for a display cover according to the present invention, said blank being ready for hardening;

Figure 7b shows a top view of a blank for a display cover according to the present invention, said blank being ready for hardening;

Figure 8 shows a top view, in a larger scale, of a finished display cover according to the present invention, i.e. the material that in hardened state is shock absorbing forms a frame around the display window;

Figure 9 shows a section along A-A in figure 8; and

Figure 10 shows a top view of a mobile phone, a display cover according to the present invention being mounted on said mobile phone.

#### **Detailed Description of a Preferred Embodiment of the Display Cover according to the Present Invention**

As is evident from figure 1 the manufacturing of the display cover according to the present invention starts with the cutting of a sheet of a protective film 1 of a PVC material having an additional plasticizer that makes the material both durable against scratches and shock absorbing..... The protective film 1 is relatively thick, suitable thickness being in the interval 0,2 -0,5 mm. A basic requirement for the present PVC material is a very high optical clearness and a very high resistance against scratches and impacts. It is also preferable if said PVC material is suitable for screen printing since the protective film 1 usually will be equipped

with a printing, e.g. a company logotype or other information, see below. A suitable commercially available PVC material for the protective film 1 has turned out to be Clearshield®.

The cut out sheet is acclimatized for printing (pre-shrunked) in order to eliminate inherent stresses in the primary material. As is illustrated in figure 2 an adhesion coating 3 is applied or screened to the portions of the protective film 1 that will constitute a frame 9 of the display cover according to the present invention. A non-adhesion coating in the shape of a narrow delimiting frame 6 is applied or screened to the portions that will constitute the display windows 5 of the display cover according to the present invention, see the enlarged detail in figure 2. Said delimiting frame 6 extends around the entire display window 5 and the width is suitably about 1 mm. By applying the adhesion coating it is guaranteed that the portion of the PVC material, i.e. the frame 9, to which the adhesion coating has been applied has a good bond strength relative to the polyurethane that will be applied in a later state, see below. If there is a need to provide the display cover according to the present invention with a screen printing, e.g. in the shape of a company logotype, such screen printing is effected on a suitable portion of the protective film 1, see the finished display cover in figure 10. Said screen printing will be located on the portion of the protective film 1 that has been treated with adhesion coating.

As is illustrated in figure 3 the sheet of protective film 1 is stamped out to suitable shape, i.e. excessive material is removed. Thereby, blanks 7 for the display cover according to the present invention are achieved, said blanks 7 having a display window 5 with a delimiting frame 6 of non-adhesion coating and a surrounding frame 9 that has been treated with adhesion coating. In figures 4a and 4b such a blank 7 is disclosed.

In figures 5a and 5b is illustrated how polyurethane (resin) 10, via a nozzle 11, is applied to the blank 7 in liquid state. Two components are mixed and fed via said nozzle 11. The amount of polyurethane 10 that is applied in liquid state is controlled by the surface that is to be coated and

the coatings applied to the blank 7. As is illustrated by the arrows 12 in figures 5a and 5b the polyurethane 10, applied in liquid state, will spread on the frame 9 that has been treated with adhesion coating. The delimiting frame 6 of non-adhesion 5 coating will prevent the polyurethane 10 from spreading on the display window 5.

When the applying of the polyurethane 10 has ceased, see figures 6a and 6b, the in liquid state applied polyurethane 10, due to its surface tension, will assume the shape of an 10 elevated protective frame 13. The polyurethane 10 will gather on and adhere to the portion of the blank 7 that is treated with adhesion coating and located around the display window 5 itself, i.e. the frame 9. The arrows 14 in figure 6b 15 illustrate how the polyurethane 10 contracts and evens out the area of supply of the polyurethane 10. The, in liquid state applied, polyurethane 10 has thus created an elevated protective frame 13 on the blank 7 around the display window 5, see figures 7a and 7b.

Then the blank 7, with the applied polyurethane 10, said 20 polyurethane 10 being in the shape of a protective frame 13, is allowed to harden during a suitable time at a suitable temperature. Normally the protective frame 13, consisting of polyurethane 10, is deep hardened in a heating chamber for a period of 24 to 48 hours. Thereby, the polyurethane 10 has a 25 molecular bond to the protective film 1.

In figure 8 and 9 a finished display cover according to the present invention is shown in a larger scale. Especially from figure 9 it is learnt how the protective frame 13 is applied to the protective film 1 and forms an elevation around 30 the display window 5. Despite the fact that the delimiting frame 6 has not been removed from the display window 5, said delimiting frame 6 has not been drawn in figures 8 and 9 since said the frame normally is transparent and has no longer any function after the hardening of the polyurethane 10.

35 The elevated protective frame 13 of polyurethane, formed in the described way, has the property of being shock absorbing and partly self-restoring against surface damage. Due to the fact that both the protective film and the frame are shock absorbing the display cover according to the present

invention has an extremely good shock absorbing ability in the area where the protective film and the frame overlap each other. The protective frame 13 preferably has a thickness in the interval 1,5 - 3 mm.

5 The display cover, manufactured in the described way, is now ready to be mounted, e.g. on a mobile phone, see figure 10. In connection with the stamping from the protective film 1 the blank 7 is given such dimensions that it will suit to the object that the display cover is mounted upon. In the 10 exemplified case of a mobile phone the adaption is made to a specific model of a certain trademark. The actual mounting is preferably carried out by adhesion and a laminating adhesive has turned out to be suitable, said laminating adhesive being marketed by 3M from the 200 MP-series and used in connection 15 with adhesion that requires high optical clearness. The laminating adhesive is applied as a sticky layer on the side of the display cover that will adhere to the mobile phone or other device having a display. Preferably the laminating adhesive is applied over the entire pending side of the 20 display cover. As a transporting protection a foil or paper sheet may be applied to the sticky layer, said foil/paper sheet being removed in connection with the mounting of the display cover. For the sake of clarity it should be pointed out that before the display cover according to the present 25 invention is applied, the temporary protective film that has been described under the headline **Prior Art** is removed.

In this connection it should be mentioned that if the display, that the display cover is mounted upon, has scratches or the like the laminating adhesive also has a healing effect 30 upon said display. This means that the laminating adhesive fills out said scratches and the surface that is visible through the display window 5 becomes clear again.

The display cover according to the present invention has normally also an effect on the light refraction, the result of 35 this being that the signs that are visible through the display window 5 are somewhat enlarged. This leads to that it becomes easier to read said signs.

As is apparent from figure 10 the display cover disclosed in said figure is equipped with for instance a

company logotype at the top of said display cover. Preferably, said company logotype is screen printed on the protective film 1 before the polyurethane is applied, see figures 5a and 5b. In such a case the polyurethane is 5 transparent, which means that the company logotype is visible through the protective frame 13 of polyurethane.

#### **Feasible Modifications of the Invention**

In this connection it should be emphasised that the 10 method described above to manufacture a display cover according to the present invention only constitutes a preferred example. Within the scope of the present invention it is thus possible to manufacture a frame of polyurethane as a separate unit, and then connect said frame and the 15 protective film by means of a suitable adhesive.

The elevated frame of polyurethane, said frame being part of the display cover, may either be manufactured in a coloured or uncoloured material. Further said frame may also be manufactured in a different material than polyurethane, 20 said different material being suitable for the appliance in question.

In the embodiment described above it is stated that text/objects may be screen printed on the protective film. Within the scope of the invention it is also feasible to use 25 other printing techniques than screen printing, e.g. offset printing and/or embossing.

Instead of using the above stated laminating adhesive, other adhesives may of course be used in order to mount the display cover on for instance a mobile phone. Within the 30 scope of the invention it is also feasible that the user himself apply an adhesive/a glue in connection with the mounting of the display cover.

The embodiment described above of the display cover according to the present invention refers to a display cover 35 for a mobile phone. However, within the scope of the present invention other areas of appliance for the display cover are feasible and in exemplifying and non-restricting purpose watches and instruments equipped with a display may be mentioned.

**Claims**

1. Display cover, e.g. for mobile phones, said display cover being intended to be applied over a display of a device,  
5 characterized in that it includes an optically clear protective film (1), said protective film (1) carrying on one side a protective frame (13) of shock absorbing material, that said protective frame (13) defines a display window (5) on the protective film (1), and that the protective film (1) has surface portions on the side that faces away from the protective frame (13), said surface portions being equipped with an adhesive or prepared for receiving an adhesive.
- 15 2. Display cover according to claim 1, characterized in that the protective frame (13) has a molecular bond to the protective film (1).
3. Display cover according to claim 1 or 2,  
20 characterized in that the protective frame (13) is manufactured from polyurethane.
4. Display cover according to claim 3,  
25 characterized in that the polyurethane is of two component type.
5. Display cover according to any of the previous claims, characterized in that the primary material of the protective film (1) should be suitable for printing, especially screen printing.  
30
6. Display cover according to any of the previous claims, characterized in that the protective film (1) is manufactured from shock absorbing PVC material.
- 35 7. Method for manufacturing a display cover, e.g. for mobile phones, characterized in that on one side of an optically clear protective film (1) an adhesion coating and a non-adhesion coating are applied in different areas of said

film (1), that a material is applied, in liquid state, to the area having an adhesion coating, said material in hardened state being shock absorbing and forming an elevated protective frame (13) on said area, and that said material is brought to 5 deep harden during suitable conditions.

8. Method according to claim 7, characterized in that the adhesion coating forms a frame (9) around the area (6) to which the non-adhesion coating has been applied, that a 10 blank (7) is stamped from the protective film (1), that the material constitutes a two component polyurethane (10), said material in hardened state being shock absorbing, said two component polyurethane (10) being applied to the frame (9) of the blank (7), and that the polyurethane (10) spreads over 15 said frame (9), and that the surface tension of the polyurethane (10) prevents it from spreading into the area (6) having the non-adhesion coating.

9. Method according to claim 7 or 8, 20 characterized in that the material is fed via a nozzle (11) or the like, said material being shock absorbing in hardened state.

10. Method according to any of the claims 7-9, 25 characterized in that the deep hardening of the material takes place in a heating chamber during a period of 24 to 48 hours, said material in hardened state being shock absorbing.

**Fig 1**

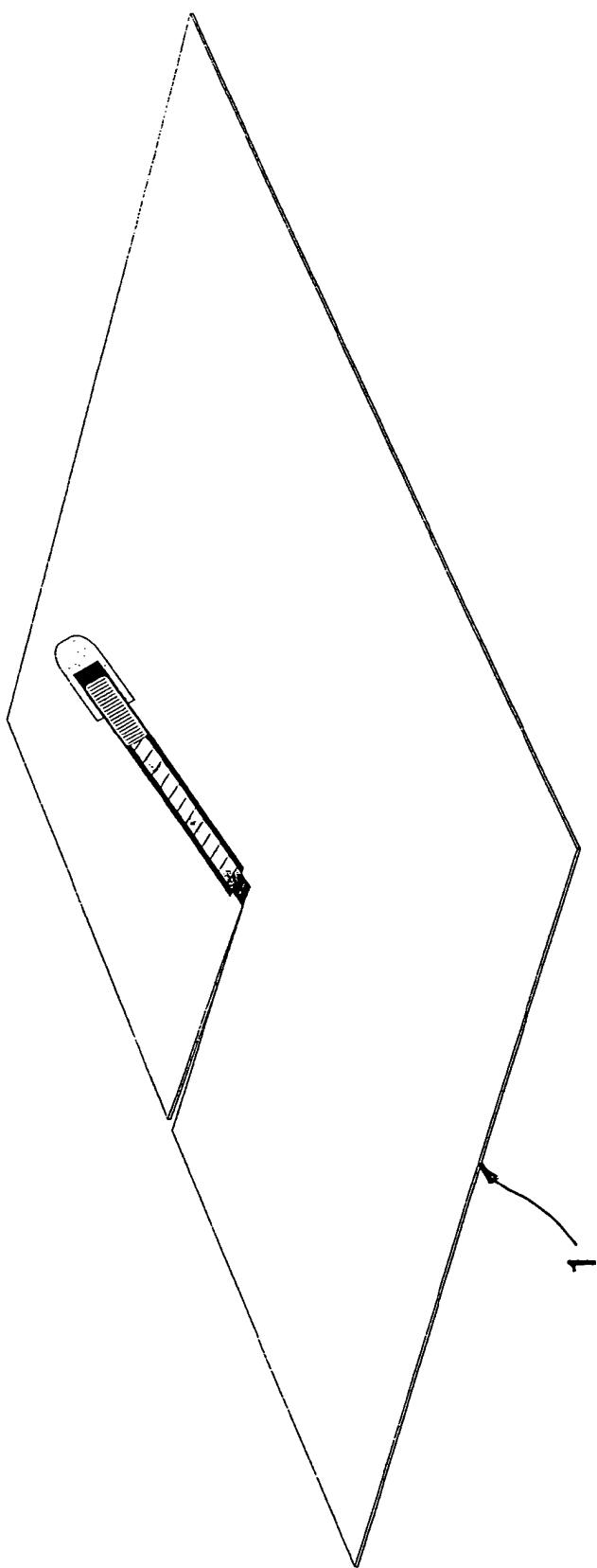


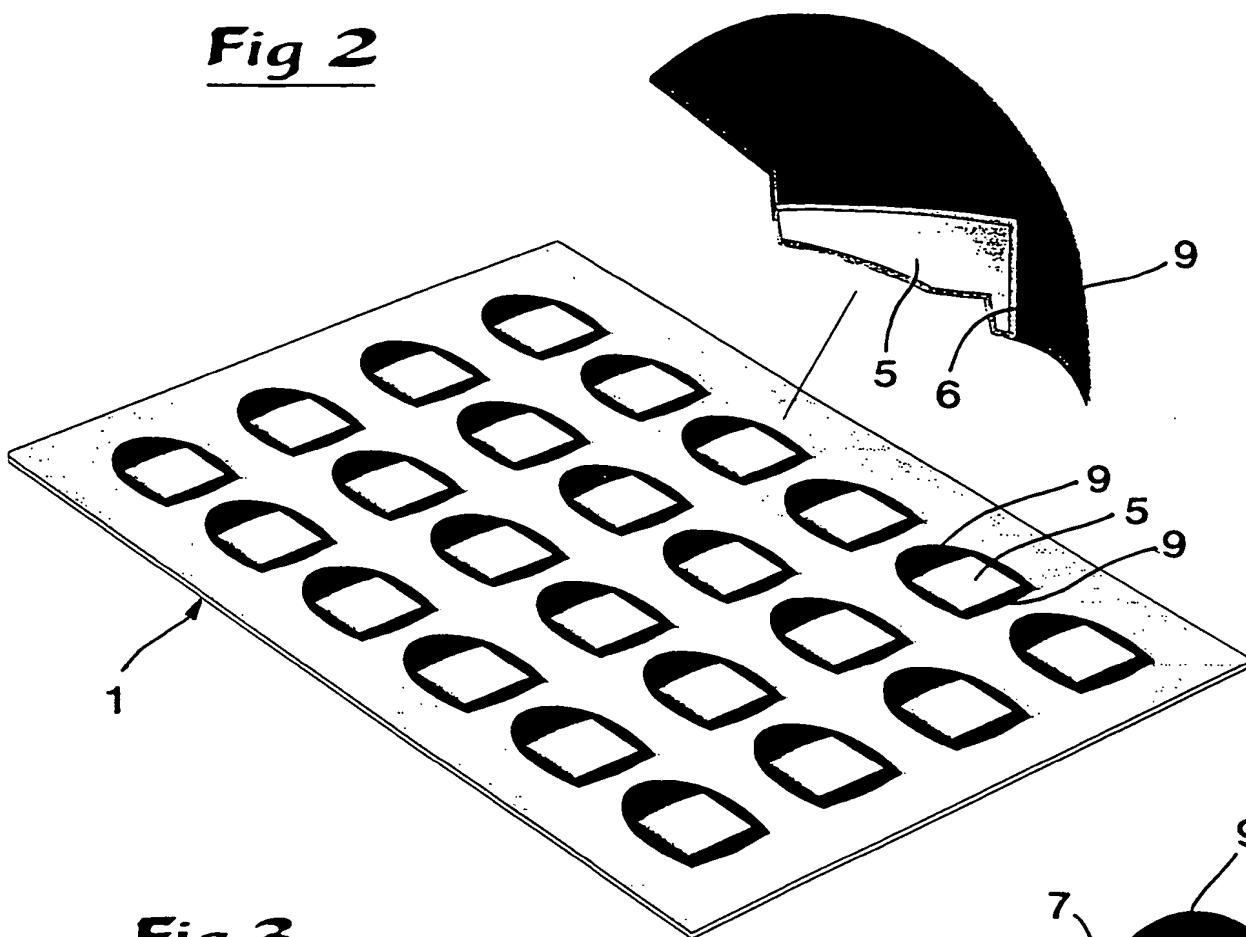
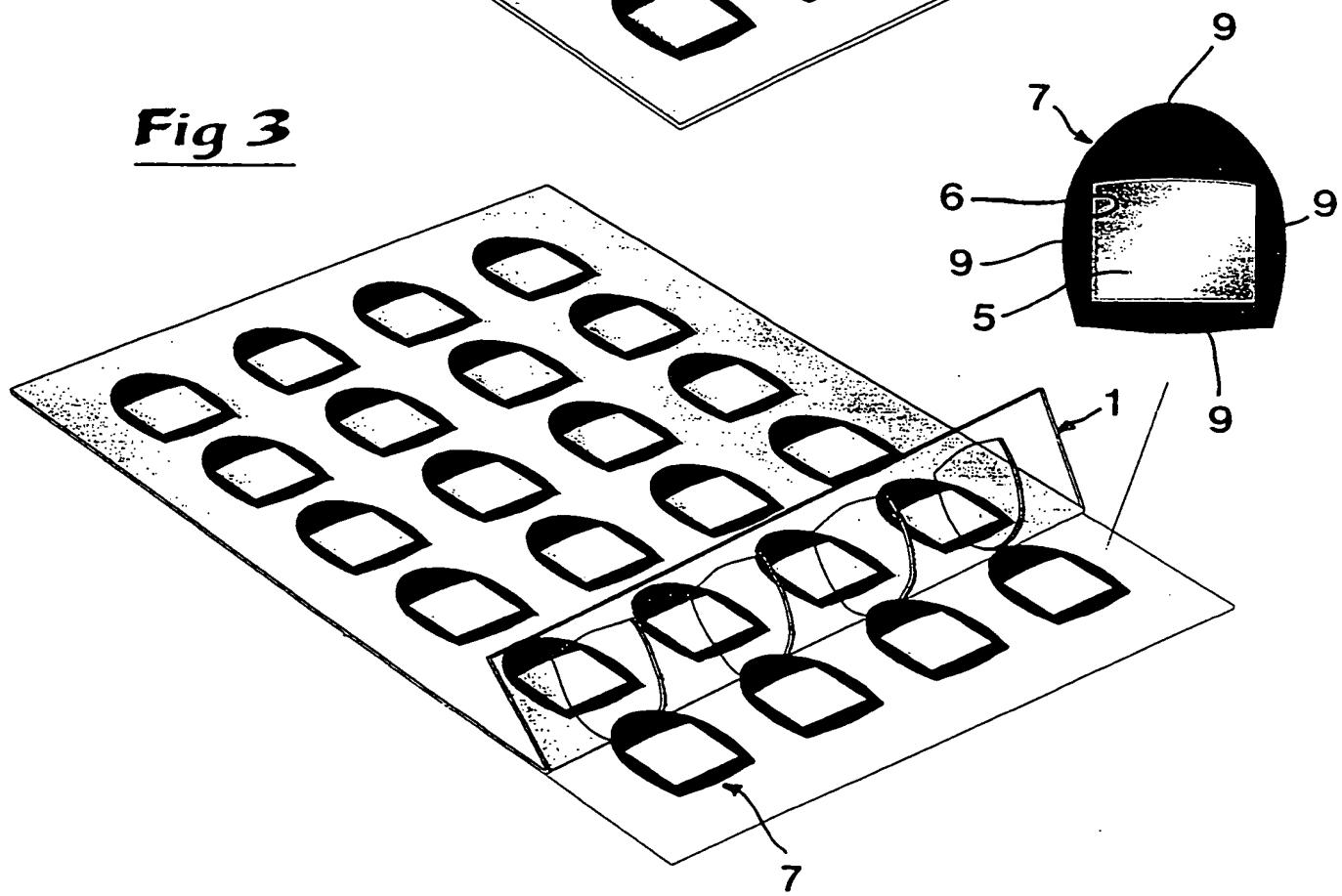
Fig 2Fig 3

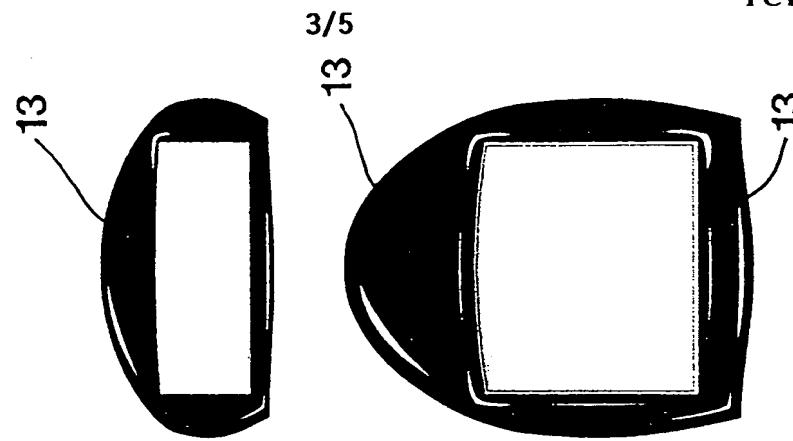
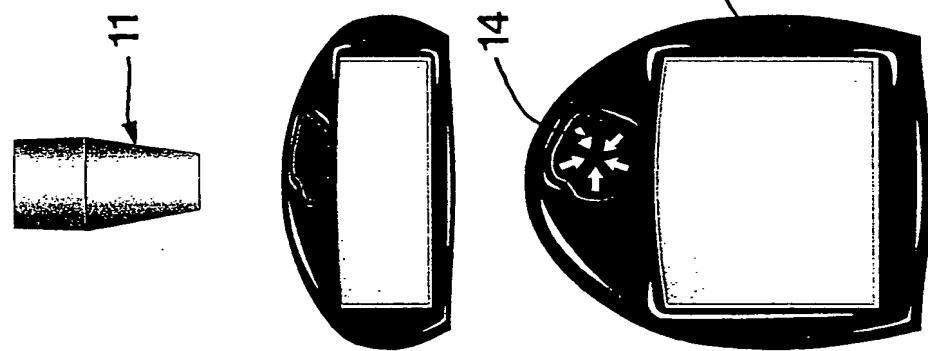
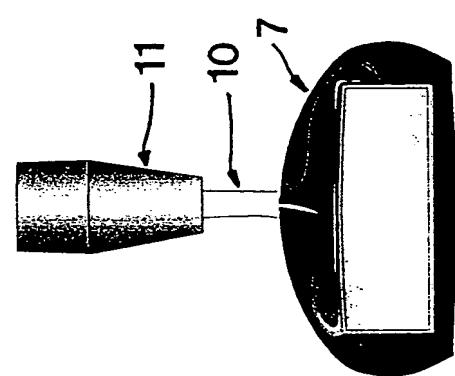
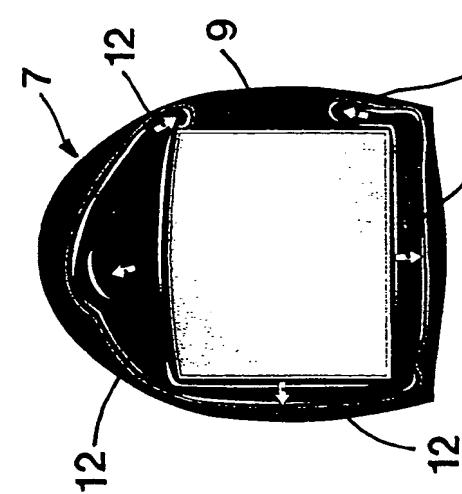
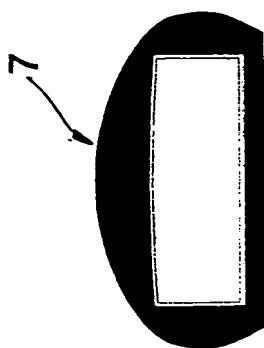
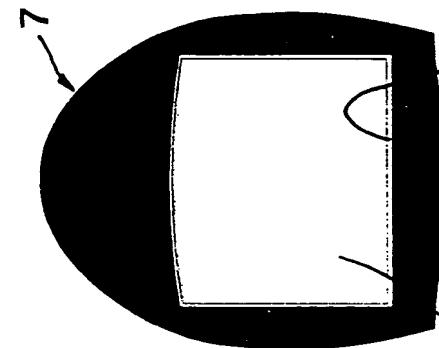
Fig 7aFig 6aFig 5aFig 4aFig 4bFig 6bFig 7b

Fig 8

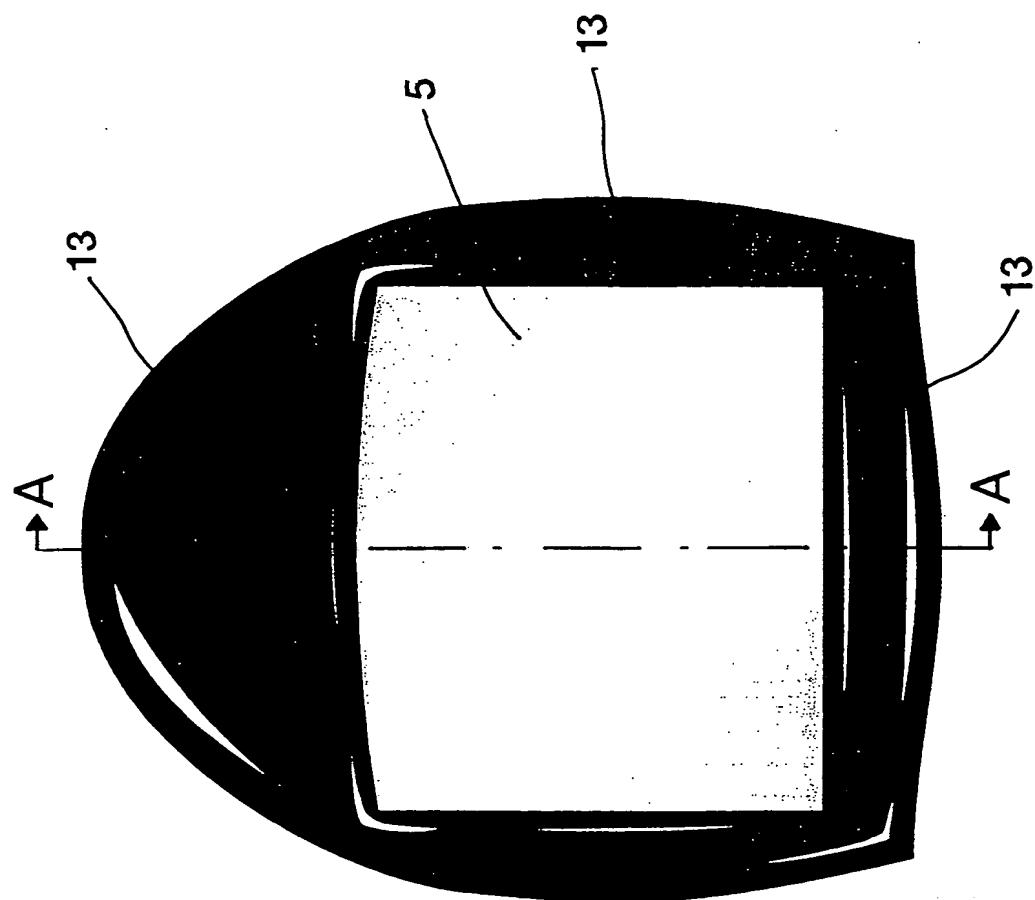
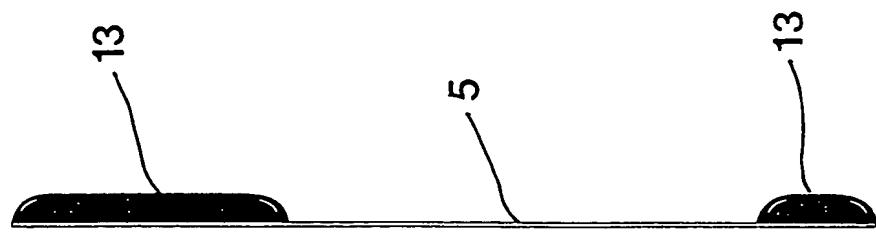


Fig 9



**Fig 10**



## INTERNATIONAL SEARCH REPORT

International application No.

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## A. CLASSIFICATION OF SUBJECT MATTER

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0841680 A1 (SONY CORPORATION), 13 May 1998 (13.05.98), page 3, line 29 - page 4, line 12, figure 1, abstract	1-6
A	--	7-10
Y	US 5214794 A (GERT VAN WIJNEN), 25 May 1993 (25.05.93), column 1, line 56 - column 2, line 2, figure 1	1-6
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## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5768370 A (VELI-MATTI MAATTA ET AL), 16 June 1998 (16.06.98), column 5, line 36 - column 6, line 21, figures 1-4	1-6
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Y	WO 9823077 A1 (ERICSSON INC.), 28 May 1998 (28.05.98), page 4, line 19 - page 7, line 5, figures 1-4	1-6
A	--	7-10
Y	US 5004320 A (TAKO NAGAI ET AL), 2 April 1991 (02.04.91), column 2, line 35 - line 57, figures 3-7	1-6
A	-- -----	7-10

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

28/09/99

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
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